



Human perceptions toward herpetofauna in northwestern Bangladesh

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Abstract.—People from different socioeconomic status show different attitudes toward herpetofauna. A study was conducted to investigate local people's perceptions and attitudes toward herpetofauna in four northwestern districts of Bangladesh. Data were collected through a structured questionnaire survey among 236 randomly selected people. Animals were divided into four groups (frogs and toads, snakes, lizards, monitor lizards) and perceptions about these animals were classified into six categories. "Killing herpetofauna as a credit" was considered as a dependent variable for performing the regression models. Among the four groups, people possessed maximum misconceptions about snakes in all six categories. Among the interviewees, 45% respondents were positive in killing snakes, which was the highest among the four groups. Bivariate analysis showed socioeconomic status (occupation) and other perceptions as poisonous, habitat sharing, and believing preconceptions were significantly related with the dependent variable. From logistic regression models we found that frog killing was influenced by landholding status of people and believing preconceptions about frogs. Killing of reptiles is associated with educational status and perceptions, such as thinking they are all poisonous, habitat sharing, and believing preconceptions. Socioeconomic status and superstitions had greater negative impact on reptiles than amphibians hence, more misbelieved by people. Coexistence of humans and wild animals through expanding and disseminating the correct knowledge about them, more sustainable use of habitats, and greater effort in scientific communities to remedy these deficiencies are needed to conserve these important groups of wild animals.

Keywords. Frog, killing herpetofauna, lizard, local community, monitor lizard, preconceptions, regression model, snake, toad

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Introduction

The interactions of humans and herpetofauna have a long history (Alves et al. 2013). People from various socioeconomic conditions and cultures possess different outlooks (Manstead 2018), which causes disparity in the human perceptions toward animals. With the growth of the human population over time, human activities such as agricultural expansion, industrialization, urbanization, infrastructural development, animal husbandry, hunting, logging, forest cleaning, and other activities have been expanding and impacting wildlife (IUCN Bangladesh 2015; Khatun et al. 2012; Lee et al. 1998). As a result, interactions between humans and herpetofauna have increased. Alves and Souto (2011) termed this variety

of past and present interactions with humans and herpetofauna as ethnoherpetology, a subdivision of ethnozoology. Ethnozoological research is not commonly conducted worldwide, one exception is Brazil, otherwise ethnoherpetological studies are typically rare (Alves and Souto 2011).

Humans often possess more positive perceptions toward fish, birds, and mammals than they do toward reptiles, amphibians, and invertebrates (Czech and Krausman 2001). Reptiles and amphibians are often feared and killed due to their unaesthetic appearance (Bkerke et al. 2001), social and ethnic reasons (Bkerke et al. 2001; Kellert 1996), and sensitive reactions like animal phobias (Knight 2008). Although they tend to be harmless and are not responsible for major economic

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losses (Ferrand et al. 2001; Pough et al. 1998), tales, folklore, misperceptions, and negative attitudes can motivate society to kill reptiles and amphibians, and thus conservation efforts can be disrupted (Ceriaco 2012). The misconceptions or preconceptions toward animals persist among local groups, which are often related to their social status and culture.

Being situated at the confluence of the Indo-China and Indian sub-regions, Bangladesh has a rich biological and cultural heritage (Khan 2008; Stanford 1991). Studies on human-wildlife conflicts and attitudes in Bangladesh usually consider larger and striking animals, such as monkeys (Ahsan and Uddin 2014), langurs (Green 1981; Khatun et al. 2012; Khatun et al. 2013), tigers (Azad et al. 2005; Inskip et al. 2013; Reza et al. 2002), and elephants (Palash et al. 2018; Sarker and Roskaft 2010; Wahed et al. 2016) with higher regard, than either amphibians and/or reptiles. These more “charismatic” species tend to receive more attention toward their conservation and achieved people’s positive attitude. On the other hand, amphibians and reptiles provide all four types of ecosystem services (i.e., provisioning, regulating, cultural, and supporting). Provisioning services are direct advantages to people, such as herpetofauna as a source of food and medicine. The benefits derived from the regulation of ecological processes, such as the control of agricultural pests and disease by herpetofauna, are referred to as regulating services. Herpetofauna also provide cultural services through spiritual enrichment, traditional rites, and aesthetic experiences, as well as supporting services as nutrient cycling in the food chain and food web. The majority of these direct and indirect services have gone unnoticed (Valencia-Aguilar et al. 2013). Moreover, this group continues to face additional threats as pollution, habitat loss, commercial use, invasive species, climate change, and infectious diseases (Collins and Crump 2009).

In Bangladesh, research has been conducted especially on diversity, status, distribution, and behavioral studies of

birds and mammals. Meanwhile, studies on herpetofaunal diversity have been randomly conducted at different field sites throughout the country (Chowdhury et al. 2016; Hasan et al. 2014; Hasan and Feeroz 2014; Hasan et al. 2017; Mahony and Reza 2008; Reza and Mukul 2009; Reza and Perry 2015; Rabbe et al. 2017a,b; Rahman et al. 2018a,b). However, to the best of our knowledge ethnoherpetological research has not been carried out yet in Bangladesh. Therefore, the specific objectives of our research were to: 1) document the misconceptions about herpetofauna among local people, and 2) assess people’s overall perceptions and beliefs in this regard.

Methods

Study Area

The study was conducted in four districts (Rangpur, Dinajpur, Thakurgaon, and Nilphamari) of Rangpur division, Bangladesh. The sites were selected as representative of protected and non-protected areas, and cultural variation was considered. Data was collected in four suburban (Saidpur, Pirgonj, Birgonj, and Posurum) and seven village (Mollikpur, Kornai, Burirhat, Harati, Singra, Mollapara, Dhelapir) areas representing the four districts (Fig. 1). All habitat types of the study area included potential habitats for herpetofauna. Non-protected areas included croplands, bushes, thickets, wetlands, fallow land, and others, whereas Sal Tree (*Shorea robusta*) cover is the main vegetation of the protected area of Singra National Park.

Questionnaire Design and Data Collection

Before starting the main survey, a pilot survey was conducted through a questionnaire among 15 local people in the study area described. The final design of the questionnaire was developed after reviewing the pilot

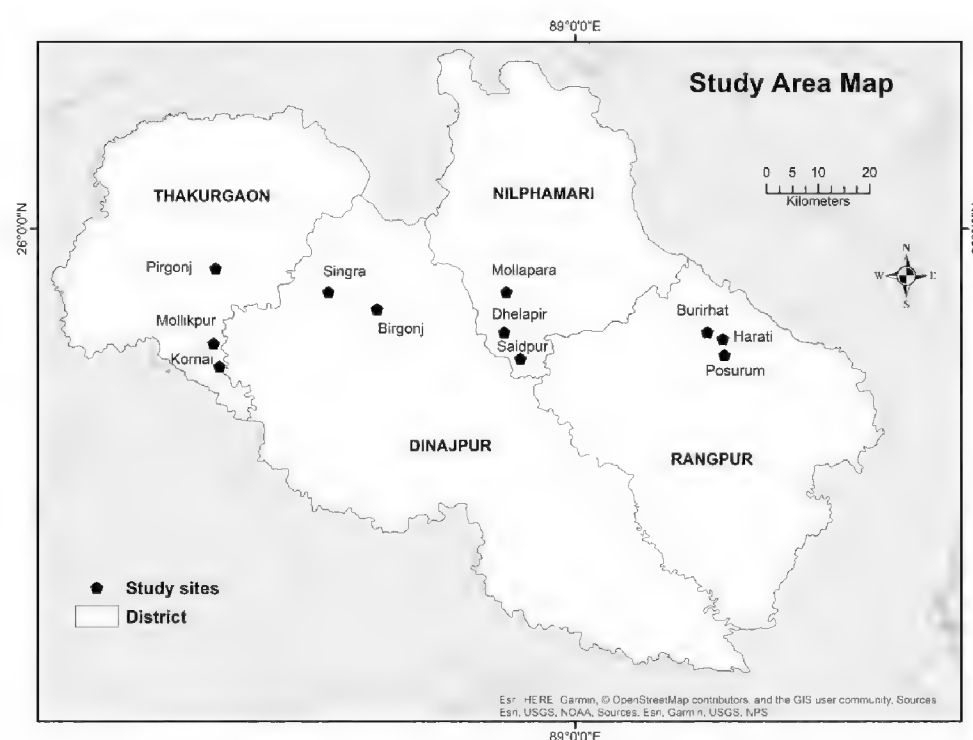


Fig. 1. Map of the study area.

sample survey. During final design, herpetofauna were divided into four groups: frogs and toads, snakes, lizards, and monitor lizards. Specific remarks about other groups of animals were collected as additional information. The survey was conducted from April 2017 to March 2018. A total sample of 236 people was interviewed in the four districts, and only one ethnic group (Santal) was surveyed among the eight ethnic communities. Random sampling was conducted in each district, and almost equal amounts of data were collected from the questionnaire sampling in each district. The questionnaire used in this survey was entirely closed-ended where answers were selected from a limited number of options, usually single-word answers such as “yes” or “no.”

Socio-economic status of the people who completed the survey were categorized in different groups to characterize the social conditions of the respondents. Respondents were categorized in three age classes: Aged = > 40 years old, Medium age = 20 to 40 years, and Adolescent = < 20 years. Occupation of respondents was classified as farmer, student, and non-farmer, i.e., any other profession. Educational level was divided into three groups: illiterate, low educated = 5th to 12th grade, and highly educated = above 12th grade. Landholding status was grouped into: Low land holders = < 0.5 acres, Medium land holders = 0.5 to 1 acre, and High land holders = > 1 acre.

Among the four herpetofaunal groups, frogs and toads represented the only amphibian group as no caecilians have been reported from the study site in the past, and the other three groups (snakes, lizards, and monitor lizards) are reptiles. Respondents considered monitor lizards as snakes (locally called “Guishap”), hence it was separated from “lizards” as a unique group. Turtles and tortoises were excluded from this survey as respondents at the study sites claimed they had not seen them in their locality.

Interviewees were fully informed about the aims and objectives of the questionnaire survey and gave consent prior to participating in the research. The survey was conducted from 1000 h to 1600 h, required 20–25 min to collect data from each person, and the hardcopy of the questionnaire was written in the Bengali language. Photographs of amphibians and reptiles from the book *Amphibians and Reptiles of Bangladesh: A Field Guide* (Hasan et al. 2014) were shown to illiterate participants during the interview to help them identify animals. Misconceptions of the participants were addressed after the interviews and their erroneous ideas about herpetofauna were clarified to increase their understanding and awareness.

Data Analysis

To identify the relationships between people’s perceptions and various independent variables logistic regression was carried out. Pearson Chi-square tests were employed

to assess the relationships among variables. Statistical tools (R and SPSS) were used to find the adjusted influence of demographic and behavioral factors of the response to the statement that “killing herpetofauna as a credit.” A logistic regression model was applied since the dependent variable is binary, i.e., “killing herpetofauna as a credit” has two categories [1=Yes, 0=No] (Hosmer et al. 2013). Maximum likelihood estimation technique was used to estimate the intercept and slope parameters. For the purpose of interpreting regression coefficients, the odds ratio (OR) was used [$OR = \exp(\beta_i)$].

Results

Socio-economic Status of the Respondents

Among the 236 respondents, 123 (52.11%) were males and 113 (47.88%) were females (Table 1). The age of the respondents varied from 15 to 78 years; with 39 respondents (21.19%) above 40 years, 147 (62.29%) were middle aged, and 50 (16.53%) were below 20 years old (Table 1). The respondents included 153 (64.83%) Muslims, 53 (22.46%) Hindus, and 30 (12.71%) Christians. As for their employment status, 39 (16.33%) were farmers, 107 (45.34%) were non-farmers, and 90 (38.14%) respondents were students (Table 1). The interviewees included 77 (32.63%) illiterate, 94 (39.83%) low educated, and 65 (27.54%) highly educated individuals; with 167 (70.76%) from rural areas and 69 (29.24%) from urban areas (Table 1). Moreover, 92 (38.98%), 125 (52.97%), and 19 (8.05%) had low, medium, and high landholding status, respectively. About one-third, 84 (35.59%) had access to social media, whereas 157 (64.41%) had no access to the social media (Table 1).

Human Perceptions toward Herpetofauna

Frogs and toads. Among the 236 respondents, 27 (11%) feared frogs and toads and showed negative attitudes in having them share their human habitations with them; while 36 (15%) respondents believed frogs and toads were poisonous animals and possessed misconceptions about this group (Fig. 2). A significant relationship was found between believing misconceptions and killing frogs and toads ($p = 0.015$) (Table 2). Among the eight socio-economic variables, only landholding status was significantly related in killing frogs and toads (Table 2). Bivariate analysis showed that different perceptions of the respondents were significantly related with either sex, religion, occupation, place of residence, land holding status, or media connection (see Supplementary Table S1).

The regression analysis showed that preconceptions had a significant impact on killing frogs ($p = 0.026$). The odds of responding positively to “killing frog as credit”

Table 1. Socio-economic status of the respondents (in percentage). Note: A = Aged, M = Middle aged, A₁ = Adolescent; M₁ = Male, F = Female; I = Islam, S = Sonaton, C = Christian; F₁ = Farmer, N = Non-farmer, S₁ = Student; I₁ = Illiterate, L = Low educated, H = Highly educated; L₁ = Low, M₂ = Medium, H₁ = High, R = Rural, U = Urban.

District Name	Age			Sex			Religion			Occupation			Education			Land Holding Status			Social Media Use		Locality	
	N	A	M	A ₁	M ₁	F	I	S	C	F ₁	N	S ₁	I ₁	L	H	L ₁	M ₂	H ₁	Yes	No	R	U
Dinajpur	57	17.5	52.6	29.8	56.1	43.9	47.4	43.9	8.8	10.5	36.8	52.6	21.1	47.4	31.6	40.4	49.1	10.5	45.6	54.4	70.2	29.8
Nilphamari	58	22.4	68.9	8.62	53.5	46.6	89.7	10.3	0	18.9	51.7	29.3	39.7	32.8	27.6	60.3	32.8	6.9	25.9	74.1	60.3	39.7
Thakurgaon	50	26	56	18	50	50	50	0	50	20	58	22	50	32	18	40	48	12	28	72	100	0
Rangpur	71	19.7	69	11.2	50.7	49.3	69	30.9	0	16.9	38	45.1	23.9	45.1	30.9	19.7	76.1	4.2	40.9	59.1	59.2	40.9
Total	236	21.2	62.3	16.5	52.1	47.9	64.8	22.5	12.7	16.5	45.3	38.1	32.6	39.8	27.5	38.9	52.9	8.1	35.6	64.4	70.8	29.2

is (5.432-1) = 4.432 times higher for people possessing preconceptions than people who did not possess preconceptions, keeping all other predictors at a fixed level (Table 3). However, poor people are (1-0.221) = 0.779 times less interested in killing frogs and toads.

Snakes. Most of the respondents, 208 (88%) were afraid of snakes, while 229 (97%) considered snakes as poisonous (venomous) animals (Fig. 2). The statement “Killing snake is a credit” was believed by 106 (45%) respondents (Fig. 2). Out of the 236 respondents, 180 (76%) stated that they saw snake biting incidents in their life at least once and 192 (81%) respondents were not willing to share their habitation with snakes (Fig. 2). Significant relationship existed between views of “killing snakes as credit” with either “poisonous,” “sharing human habitat is harmful,” “belief in preconceptions,” and “seen attacking people” (Table 2). Occupation had a significant role in considering snake killing as a credit ($p = 0.013$). Non-farmers (55.1%) were more positive toward killing snakes than farmers and students (Table 2). Other perceptions of snakes were found to be significantly related with sex, religion, occupation, media connection, and place of residence in the bivariate analysis (see Supplementary Table S2).

Highly educated respondents were more likely to consider killing snakes as a credit, and the odds were (2.822-1) = 1.822 times higher than others. Human habitat sharing with snakes and believing preconceptions have significant correlations with killing snakes ($p = 0.004$, 0.0005, respectively). Killing snake as credit is considered favorable by respondents who believed that sharing human habitation causes damage and the odds were (3.863-1) = 2.863 times as high as those who did not. People possessing preconceptions are (2.984-1) = 1.984 times more likely to believe that killing snake is a credit than those with no preconceptions toward snakes (Table 4).

Lizards. Among the respondents, one-fifth (20%) feared lizards, and 84 (36%) answered “Yes” to “lizards are poisonous animals” (Fig. 2). Killing lizards was associated significantly with thinking of lizards as poisonous animals ($p = 0.000$) (Table 2). Although only 16% respondents agreed that sharing human habitation with lizards is not harmful to people (Fig. 2), the killing of lizards was significantly related with the response to sharing respondent’s habitats (Table 2). Among all the respondents, 44 (19%) believed the superstitions (e.g., blood sucking ability, poisonous animal, and relation to diseases) about lizards and 24 (10%) respondents thought killing lizards was not a bad deed (Fig. 2). These superstitions about lizards influenced the responder’s belief in killing lizards as a creditable act, which had a significant relationship (Table 2). Among all the socio-economic variables, only occupation was significantly associated with killing lizards (Table 2). Age, sex, occupation, education, and media connection were significantly related with the perceptions shown in

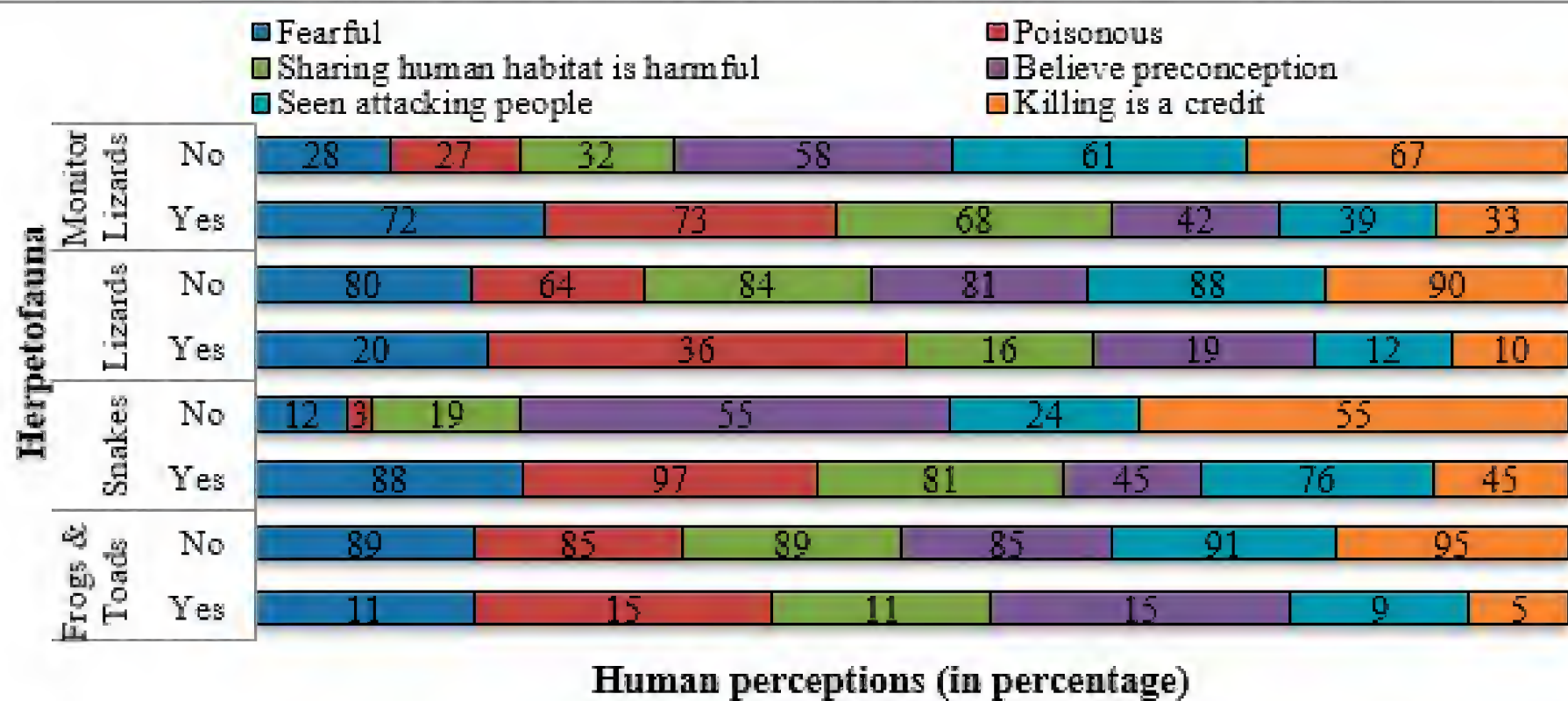


Fig. 2. Perceptions toward herpetofauna (in percentage, with the "Yes" and "No" responses for each combination of Herpetofauna group and perception color summing to 100%).

Supplementary Table S3.

The relationship between education and considering lizard killing as a credit is significant (Table 5). The odds of killing lizards as a credit is $(25.872-1) = 24.872$ times higher for people with higher education and $(8.013-1) = 7.013$ times higher for people with primary and secondary education than illiterate people, keeping all other predictors at a fixed level. Respondents considering lizards as poisonous was highly significantly correlated with sharing their habitat is harmful to them ($p= 0.001$) and the relationship with killing lizards ($p= 0.001$). Killing lizards is $(10.178-1) = 9.178$ times higher in respondents considering lizards as poisonous, and $(7.174-1) = 6.174$ times higher in respondents thinking that sharing their habitat with lizards is harmful to them (Table 5).

Monitor lizards. Monitor lizards were considered to be snakes by most of the respondents, with 170 (72%) indicating they were fearful of them, and 173 (73%) believed them to be poisonous animals (Fig. 2). Among the respondents, 161 (68%) disagreed with sharing their household with monitor lizards and 99 (42%) respondents had misconceptions (e.g., spraying poisonous saliva, considering these animal as snakes) about these animals. Killing monitor lizard was significantly related with thinking of monitor lizards as poisonous, considering habitat sharing as harmful, and possessing erroneous perceptions about them (Table 2). Of the total respondents, 79 (33%) thought that killing monitor lizards is a heroic deed, and about two-fifths (39%) asserted that they had seen monitor lizards attacking humans, especially children (Fig. 2). Similar to snakes and lizards above, the killing of monitor lizards was significantly associated with occupation (Table 2). Other than killing, the other perceptions toward monitor lizards were significantly related with age, religion, occupation, and media connection (see Supplementary Table S4).

Monitor lizards are killed as they are considered to be harmful, and preconceptions are believed by the

respondents, with highly significant correlations ($p = 0.008$ and 0.0009 , respectively). The odds of considering killing monitor lizards as a credit is $(2.854-1) = 1.854$ times higher in people who think sharing human habitation could cause harm to themselves. People believing preconceptions are $(3.149-1) = 2.149$ times greater among those who think of killing monitor lizards as a credit than those who are aware of the superstitions (Table 6).

Discussion

Impact of socio-demographic status and human perceptions toward herpetofauna. Any belief or feeling perceived by humans about biodiversity is reflected in their attitudes toward it (Pooley 2000). For instance, the Common Langur (*Semnopithecus entellus*) is venerated as a God in the Hindu religion (Khatun et al. 2012). To determine the attitudes of people in Bangladesh toward herpetofauna, respondents were asked some closed-ended questions regarding different herpetofaunal groups. The results showed significantly varying attitudes and perceptions for different groups of herpetofauna.

People with low land holding status are more inclined to kill amphibians (Table 2). These individuals have the attitude that they have little space in which to live, so why should they share it with others? Respondents believe many misconceptions, like “killing frogs and toads bring nightmares” that they are compelled to consider those animals as harmful. This thinking clearly indicates that social status of the respondents affects their psychological attitudes and behavior toward these animals. Furthermore, frogs and toads are considered as among the dirtiest of animals since they leave their feces in and around the home and yard, which respondents thought to be a sign of impurity.

Religious views often promote beliefs in superstitions. For example, Muslims considered killing snakes and lizards as a deed of ‘Sunnah’ (Islamic belief) whereas

Table 2. Human perception toward herpetofauna considering “Killing is a credit” as a dependent variable in relation to different socioeconomic status and other perceptions of the respondents.

Variables	Category	Killing is a credit							
		Frog and Toads		Snakes		Lizards		Monitor Lizards	
		Yes (%)	χ^2 (<i>p</i> -value)	Yes (%)	χ^2 (<i>p</i> -value)	Yes (%)	χ^2 (<i>p</i> -value)	Yes (%)	χ^2 (<i>p</i> -value)
Age	<20	8.0	1.80 (0.407)	54.0	2.44 (0.296)	18.0	3.97 (0.138)	44.0	3.32 (0.191)
	20-40	3.4	—	43.5	—	10.2	—	29.9	—
	40+	5.1	—	38.5	—	5.1	—	33.3	—
Sex	Female	2.7	1.96 (0.161)	40.7	1.55 (0.213)	7.1	3.23 (0.064)	28.3	2.59 (0.108)
	Male	6.5	—	48.8	—	14.6	—	38.2	—
Religion	Islam	3.9	0.58 (0.749)	48.4	3.34 (0.188)	10.5	1.53 (0.466)	34.6	0.35 (0.839)
	Sonaton	5.7	—	34.0	—	15.1	—	30.2	—
	Christian	6.7	—	46.7	—	6.7	—	33.3	—
Occupation	Farmer	2.6	1.60 (0.450)	41.0	8.75 (0.013)	10.3	10.40 (0.006)	30.8	8.64 (0.013)
	Non-farmer	6.5	—	55.1	—	17.8	—	43.0	—
	Students	3.3	—	34.4	—	3.3	—	23.3	—
Education	No Education	6.5	2.10 (0.350)	48.1	1.28 (0.529)	7.8	3.89 (0.143)	37.7	2.28 (0.319)
	Primary & Secondary	5.3	—	40.4	—	16.0	—	35.1	—
	Higher	1.5	—	47.7	—	7.7	—	26.2	—
Place of Residence	Rural	4.2	0.28 (0.595)	45.5	0.08 (0.775)	10.2	0.00 (0.994)	32.9	0.08 (0.784)
	Urban	5.8	—	43.5	—	10.1	—	34.8	—
Landholding Status	Low	8.7	6.02 (0.049)	46.7	0.90 (0.637)	13.0	3.50 (0.174)	37.0	1.84 (0.398)
	Medium	1.6	—	42.4	—	8.0	—	32.8	—
	High	5.3	—	52.6	—	21.1	—	21.1	—
Media Connection	No	5.3	0.35 (0.555)	48.0	1.67 (0.196)	13.8	3.41 (0.065)	37.5	3.11 (0.078)
	Yes	3.6	—	39.3	—	6.0	—	26.2	—
Fearful	No	4.8	0.06 (0.802)	46.4	0.3 (0.864)	9.0	3.68 (0.055)	34.8	0.08 (0.780)
	Yes	3.7	—	44.7	—	18.8	—	32.9	—
Poisonous	No	4.5	0.08 (0.782)	14.3	2.74 (0.098)	2.7	29.28 (0.000)	21.3	5.47 (0.019)
Sharing human habitat is harmful	No	3.8	3.11 (0.078)	22.7	10.76 (0.001)	8.5	7.93 (0.005)	17.6	12.25 (0.000)
	Yes	11.5	—	50.0	—	24.3	—	40.7	—
Believe preconception	No	3	8.14 (0.015)	32.3	18.60 (0.000)	7.0	13.90 (0.000)	19.3	28.62 (0.000)
	Yes	13.9	—	60.4	—	25.5	—	52.5	—
Seen attacking people	No	5.1	1.19 (0.276)	33.9	3.58 (0.058)	22.0	0.26 (0.610)	34.0	0.051 (0.822)
	Yes	0.0	—	48.3	—	13.8	—	32.6	—

Table 3. Estimates of regression parameters with standard error (SE), 95% confidence interval (CI), *p*-value, and odds ratio (OR) obtained from logistic regression model: *Frog and toad killing*.

Variables	Category	Estimates	SE	95% CI	<i>p</i> -value	OR
	(Intercept)	-4.697	1.467	(-7.57, -1.82)	0.001	0.009
Age	<20	—	—	—	—	—
	20-40	-0.330	0.873	(-2.04, 1.38)	0.705	0.719
	40+	-1.053	1.483	(-3.96, 1.85)	0.477	0.349
Sex	Female	—	—	—	—	—
	Male	1.089	0.936	(-0.74, 2.92)	0.244	2.972
Religion	Islam	—	—	—	—	—
	Sonaton	0.407	0.847	(-1.25, 2.07)	0.631	1.502
	Christian	0.119	1.039	(-1.92, 2.15)	0.909	1.126
Occupation	Farmer	—	—	—	—	—
	Non-farmer	1.951	1.307	(-0.61, 4.51)	0.135	7.035
	Students	1.798	2.028	(-2.18, 5.77)	0.375	6.037
Education	No Education	—	—	—	—	—
	Primary and Secondary	-0.730	0.961	(-2.61, 1.15)	0.447	0.482
	Higher	-1.925	1.574	(-5.01, 1.16)	0.221	0.146
Place of Residence	Rural	—	—	—	—	—
	Urban	0.499	0.865	(-1.20, 2.19)	0.564	1.647
Landholding Status	Low	—	—	—	—	—
	Medium	-1.509	0.881	(-3.24, 0.22)	0.087	0.221
	High	-0.941	1.343	(-3.57, 1.69)	0.483	0.390
Media Connection	No	—	—	—	—	—
	Yes	0.605	1.471	(-2.28, 3.49)	0.681	1.832
Believe preconception	No	—	—	—	—	—
	Yes	1.692	0.762	(0.20, 3.19)	0.026	5.432

Hindus were devoted to the worship of snakes. The work of Uyeda et al. (2014) on the role of traditional beliefs for the conservation of herpetofauna in Indonesia revealed that the Water Monitor Lizard (*Varanus salvator*) and the Reticulated Python (*Python reticulatus*) were being conserved by the locals because of their existing positive beliefs toward these animals. This study also found that Hindus were not eager to kill snakes because of their religious views, but Muslims and Christians often had the opposite view (negative).

Electronic media, such as television, has played a negative role in reinforcing the erroneous beliefs about herpetofauna among rural people. The cinema, mythical dramas, documentaries, and other forms which depict herpetofauna, especially snakes and lizards, often influence local people to believe in misconceptions. For example, the Ornate-flying Snake (*Chrysopelea ornata*, locally called ‘Kalnagini’), is a non-venomous snake but it is shown and represented as a venomous snake in many cinematic productions in Bangladesh. Snakestone (locally called ‘Moni’) is believed to have magical and healing powers shown in many Indian and Bangladeshi cinemas for entertainment as well as imposed by snake charmers

(Jaman et al. 2020). Some people believe that snakestones (i.e. a stone which is believed to be made by the snake and carried on its head) can heal snakebites and it is practiced in many countries of Asia, Africa, and Latin America (Baldwin 1995). These beliefs possibly inspire people to kill snakes for collecting snakestone. In addition, the transformation of human to snake and vice-versa is often shown in mythical dramas and people subconsciously acclimatize their minds to believe in this fantasy. Some documentaries of the Discovery Channel and Animal Planet show that saliva of Komodo Dragons is poisonous. Local people who watched these documentaries mistakenly compare Komodo Dragons with other monitor lizards of Bangladesh and consider them as equally poisonous and harmful as Komodos. This perception influences people to kill native monitor lizards. The present study showed a significant relationship in killing lizards and monitor lizards with these negative media connections (Table 2).

Lack of education on the importance and role of herpetofaunas in ecosystems among people was responsible for holding many misconceptions and negative thoughts toward these animal groups. While

illiterate people in the survey often ruled out the importance of herpetofauna, on the other hand, literate people can have superficial ideas on herpetofauna, and hence negative attitudes arise as a result. Literate people often considered some species as aggressive, lethal, or harmful. For example, respondents considered monitor lizards as snakes since they show the protruding bifurcate tongue, though they are actually lizards. Of the respondents, 73% considered monitor lizards as a poisonous animal (Fig. 2). Almost all respondents believed that all snakes found in their locality were venomous, except for the Checkered Keelback (*Xenochrophis piscator*). Lizards, frogs, and toads were also erroneously considered as poisonous animals.

Although, most respondents possessed false ideas about herpetofauna, students were more rational in some cases. They stated that wild animals have the right to roam freely in nature such as humans do. Students also mentioned the importance of herpetofauna, such as them helping maintain an ecological balance and controlling pest animals. Individual interests on wildlife education played a role in creating positive attitudes toward them. Herpetofauna as well as other animals usually interact more with farmers. In this study, we found that farmers had a more rational approach toward these animals than other professions. Generally, farmers are more attached with nature and other wild animals. This attachment and interaction creates affection (or bitterness in some cases) among this group and we found mostly positive results with farmers (Table 2).

Impact of human perceptions in killing herpetofauna. Negative opinions were actually an outcome of different myths and misconceptions about herpetofauna which have been practiced by local communities for ages. Some of these beliefs people had are that dead frogs and toads could come to their dreams, snakes bear snakestone on their head which is thought by many to have magical and healing powers, snakes could take revenge after death, garden lizards could suck blood, monitor lizards could spray poisonous saliva causing skin rot, and so on. Some believed that diseases of humans were related to the activity of lizards.

Negative attitudes and misbeliefs were more acute for reptiles than amphibians (Ceriaco 2012). These negative attitudes and misbeliefs are more pronounced for snakes and monitor lizards, than other types of amphibians and reptiles (Fig. 2). Being larger and more visible than amphibians, reptiles interact with humans more frequently. For this, people showed less of a negative attitude toward frogs and toads. Respondents claimed they faced economical loss due to monitor lizards and snakes as these creatures often eat their domestic cockerel and snake bite causes death of domestic animals, as well as humans. Hence, people were willing to eradicate snakes and monitor lizards from their homestead areas. The study of Nolan et al.

(2006) suggested that snails, crabs, snakes, lizards, and turtles were the most neglected animals, much more than mammals, birds, or fish. Significant results were observed for killing amphibians in relation to habitat sharing and believing superstitions (Table 2) by participants of the study. Results for killing reptiles were significant with all variables and this suggests reptiles were more phobia-inducing animals than amphibians. This reflects the idea that reptiles caused more of a threat to humans, than either mammals or amphibians (Ohman and Soares 1994; Ohman and Mineka 2003; Sagan 1977).

Society, community, and killing. Bangladesh has a total of 27 ethnic communities and among them, eight reside in the four districts surveyed (BBS 2011). We interviewed 42 (about 18% of total respondents) Santals people, the largest ethnic group in the Dinajpur and Thakurgaon regions, to learn about their attitudes toward amphibians and reptiles. According to IUCN Bangladesh (2015), ethnic communities of both hill and plain lands use to hunt Bull Frog (*Hoplobatrachus tigerinus*), Marbled Cascade Frog (*Amolpos marmoratus*), large snakes, monitor lizards (*Varanus* sp.), and turtles for protein consumption. Santals of Dinajpur and Thakurgaon were personally asked if this kind of act was performed by them. They stated that killing of herpetofauna especially reptiles were considered an act of heroism in their communities and they often hunted traditionally. Bull frogs and monitor lizards are larger in size than their corresponding groups of animals and considered as a potential source of meat and one of the primary reasons for hunting them by Santals. Ethnic communities living inside forest areas were reported to hunt Tokay Gecko (*Gekko gecko*) for producing medicines and pythons and cobras for use in the lucrative skin and tannery industries by the forest department (IUCN Bangladesh 2015).

Indigenous people kill herpetofauna for food but other people kill them for pleasure and gaining credit among locals. Especially killing of snakes and monitor lizards was considered as creditable work by individuals. This study reported four killing incidents of reptiles during the survey: two in Thakurgaon (Kornai), one in Dinajpur (Singra), and one in Rangpur (Posurum). Three snakes (Binocellate Cobra, *Naja naja*; Checkered Keelback, *Fowlea piscator*; Common Wolf Snake, *Lycodon aulicus*) and one monitor lizard (Yellow Monitor, *Varanus flavescens*) were killed. People, especially children, were interested in catching and killing Bull and Skipper frogs considered a “fun” activity during the rainy season. People’s negative attitudes toward herpetofauna had promoted killing activities in this region for decades.

Recommendations. To replace misconceptions with positive attitudes, we suggest a two-way model: 1) local community participation in herpetofauna conservation

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Table 4. Estimates of regression parameters with standard error (SE), 95% confidence interval (CI), *p*-value, and odds ratio (OR) obtained from logistic regression model: *Snake killing*.

Variables	Category	Estimates	SE	95% CI	<i>p</i> -value	OR
	(Intercept)	-2.540	1.297	(-5.08, 0.00)	0.05	0.079
Age	<20	—	—	—	—	—
	20-40	-0.626	0.417	(-1.44, 0.19)	0.133	0.535
	40+	-0.270	0.650	(-1.54, 1.00)	0.677	0.763
Sex	Female	—	—	—	—	—
	Male	0.628	0.387	(-0.13, 1.39)	0.105	1.873
Religion	Islam	—	—	—	—	—
	Sonaton	-0.467	0.389	(-1.23, 0.29)	0.231	0.627
	Christian	-0.243	0.493	(-1.21, 0.72)	0.622	0.784
Occupation	Farmer	—	—	—	—	—
	Non-farmer	0.696	0.514	(-0.31, 1.70)	0.176	2.006
	Students	-0.343	0.779	(-1.87, 1.18)	0.659	0.709
Education	No Education	—	—	—	—	—
	Primary and Secondary	0.0398	0.424	(-0.79, 0.87)	0.927	1.039
	Higher	1.038	0.623	(-0.18, 2.26)	0.096	2.822
Place of Residence	Rural	—	—	—	—	—
	Urban	0.048	0.372	(-0.68, 0.78)	0.898	1.049
Landholding Status	Low	—	—	—	—	—
	Medium	0.056	0.326	(-0.58, 0.70)	0.863	1.058
	High	0.107	0.583	(-1.04, 1.24)	0.855	1.113
Media Connection	No	—	—	—	—	—
	Yes	-0.083	0.488	(-1.04, 0.87)	0.865	0.920
Fearful	No	—	—	—	—	—
	Yes	-0.515	0.509	(-1.51, 0.48)	0.311	0.597
Poisonous	No	—	—	—	—	—
	Yes	0.625	1.273	(-1.87, 3.12)	0.623	1.867
Sharing human habitat is harmful	No	—	—	—	—	—
	Yes	1.352	0.474	(0.42, 2.28)	0.004	3.863
Believe preconception	No	—	—	—	—	—
	Yes	1.093	0.315	(0.47, 1.71)	0.0005	2.984
Seen attacking people	No	—	—	—	—	—
	Yes	0.346	0.372	(-0.38, 1.07)	0.353	1.412

and oversight by the government, and 2) increased effort of the scientific community to educate the public regarding the non-threat of herpetofauna and their many positive benefits. The first step enumerated could follow the steps below:

i) Awareness program: The most important task is to educate people about animals, with a focus on herpetofauna. The Forest Department under the Ministry of Environment, Forest, and Climate Change is the authority for the protection and conservation of wildlife in Bangladesh. They should take the lead role in raising national awareness about herpetofauna by involving the various stakeholders in the community.

ii) Positive use of media: The media can play an important role in educating the public by producing news and documentaries regarding untrue myths about herpetofauna and other wild animals. Cinemas and dramas that more likely than not broadcast false information should be barred from airing or at the very least have oversight groups of experts (trained biologists) that monitor information being aired to help decrease the flow of negative and/or untrue statements being propagated and reinforcing untrue myths. Using social media to raise public awareness might be a promising strategy to increase educate of the public to the true nature of animals as nonthreats.

Table 5. Estimates of regression parameters with standard error (SE), 95% confidence interval (CI), *p*-value, and odds ratio (OR) obtained from logistic regression model: *Lizard killing*.

Variables	Category	Estimates	SE	95% CI	<i>p</i> -value	OR
	(Intercept)	-5.497	1.267	(-7.98, -3.01)	0.000	0.004
Age	<20	—	—	—	—	—
	20-40	-1.132	0.725	(-2.55, 0.29)	0.118	0.322
	40+	-0.875	1.134	(-3.09, 1.35)	0.440	0.417
Sex	Female	—	—	—	—	—
	Male	1.17	0.695	(-0.19, 2.53)	0.092	3.222
Religion	Islam	—	—	—	—	—
	Sonaton	0.912	0.676	(-0.41, 2.24)	0.177	2.490
	Christian	-0.194	0.964	(-2.08, 1.69)	0.841	0.824
Occupation	Farmer	—	—	—	—	—
	Non-farmer	0.511	0.872	(-1.20, 2.22)	0.558	1.667
	Students	-2.142	1.472	(-5.03, 0.74)	0.146	0.117
Education	No Education	—	—	—	—	—
	Primary and Secondary	2.081	0.824	(0.47, 3.69)	0.012	8.013
	Higher	3.253	1.167	(0.97, 5.54)	0.005	25.872
Place of Residence	Rural	—	—	—	—	—
	Urban	0.078	0.698	(-1.29, 1.44)	0.911	1.081
Landholding Status	Low	—	—	—	—	—
	Medium	-0.759	0.621	(-1.98, 0.46)	0.221	0.468
	High	-0.488	1.034	(-2.52, 1.54)	0.637	0.614
Media Connection	No	—	—	—	—	—
	Yes	-0.106	0.948	(-1.96, 1.75)	0.911	0.899
Fearful	No	—	—	—	—	—
	Yes	0.177	0.638	(-1.07, 1.43)	0.781	1.194
Poisonous	No	—	—	—	—	—
	Yes	2.32	0.708	(0.93, 3.71)	0.001	10.178
Sharing human habitat is harmful	No	—	—	—	—	—
	Yes	1.970	0.707	(0.59, 3.36)	0.005	7.174
Believe preconception	No	—	—	—	—	—
	Yes	0.687	0.615	(-0.52, 1.89)	0.264	1.988

iii) Addition of wildlife education in existing curriculum: In Bangladesh, the current primary and secondary school curricula do not include any information about wild animals and nature conservation. As a result, animal attachment and affection are rare from an early age. This should be changed by including adequate fundamental information into the existing curriculum. Nature and animal-based education can be gained by including it as a formal learning component in textbooks and implementing structured activities in schools or on field trips. Informal learning can also occur during free play, backyard nature exploration, and green schoolyards on the grounds or in any other natural settings.

The scientific community's involvement is essential in spreading a positive message to the public. This can be accomplished by the following measures:

iv) Individual involvement: Individual participation of researchers, students, and teachers in ethnographic research is needed. Perceptions and attitudes will differ depending on location, race, tradition, and other factors. General measures to increase the public's education cannot be implemented without knowing the current state of human attitudes and perceptions in all parts of the country. We encourage scholars and students to conduct research on this vast topic. The research findings can be used to choose the best techniques in helping change the public's attitude toward wildlife, and especially herpetofaunas.

v) Organization involvement: Universities, nature-based organizations like the International Union for Conservation of Nature (IUCN), NGOs, and volunteer organizations should show interest in

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Table 6: Estimates of regression parameters with standard error (SE), 95% confidence interval (CI), *p*-value, and odds ratio (OR) obtained from logistic regression model: *Monitor lizard killing*.

Variables	Category	Estimates	SE	95% CI	<i>p</i> -value	OR
	(Intercept)	-2.321	0.758	(-3.81, -0.84)	0.002	0.098
Age	<20	—	—	—	—	—
	20-40	-0.424	0.436	(-1.28, 0.43)	0.331	0.655
	40+	-0.508	0.655	(-1.79, 0.78)	0.438	0.601
Sex	Female	—	—	—	—	—
	Male	0.498	0.399	(-0.29, 1.28)	0.213	1.646
Religion	Islam	—	—	—	—	—
	Sonaton	-0.237	0.407	(-1.03, 0.56)	0.561	0.789
	Christian	-0.011	0.512	(-1.02, 0.99)	0.983	0.989
Occupation	Farmer	—	—	—	—	—
	Non-farmer	0.762	0.555	(-0.33, 1.85)	0.170	2.142
	Students	0.039	0.809	(-1.55, 1.63)	0.961	1.040
Education	No Education	—	—	—	—	—
	Primary and Secondary	0.138	0.444	(-0.73, 1.01)	0.755	1.148
	Higher	0.304	0.611	(-0.89, 1.50)	0.619	1.356
Place of Residence	Rural	—	—	—	—	—
	Urban	0.263	0.383	(-0.49, 1.01)	0.494	1.301
Landholding Status	Low	—	—	—	—	—
	Medium	0.051	0.343	(-0.62, 0.72)	0.881	1.053
	High	-1.099	0.684	(-2.44, 0.24)	0.108	0.333
Media Connection	No	—	—	—	—	—
	Yes	-0.022	0.502	(-1.01, 0.96)	0.964	0.978
Fearful	No	—	—	—	—	—
	Yes	-0.596	0.388	(-1.36, 0.16)	0.124	0.551
Poisonous	No	—	—	—	—	—
	Yes	0.420	0.444	(-0.45, 1.29)	0.344	1.522
Sharing human habitat is harmful	No	—	—	—	—	—
	Yes	1.049	0.396	(0.27, 1.83)	0.008	2.854
Believe preconception	No	—	—	—	—	—
	Yes	1.147	0.346	(0.47, 1.83)	0.0009	3.149

doing research as well as participate in education, training, and awareness programs. Ethnozoology should be the priority of research, and organizations should focus on small, neglected animals that are often declining worldwide such as amphibians. These organizations are acceptable to the general public. Increased research will generate more interest, and these organizations could produce comprehensible material for illiterate locals, resulting in better and more positive perceptions by the general public and thus improved conservation of animals.

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Md. Mahabub Alam is currently working as a Lecturer of Zoology at the University of Dhaka, Bangladesh. Mahabub is working on projects of herpetofaunal diversity and distribution, human-herpetofauna interactions, and conflicts and mitigation measures. He has guided three M.S. research students as a co-supervisor who actually worked on amphibians and reptiles. Mahabub is interested in wildlife conservation and management, sustainable use of wildlife resources, species distribution, and behavioral ecology of wild animals, especially primates, amphibians, and reptiles.



Md. Mokhlesur Rahman is currently working toward a Ph.D. at Durham University, United Kingdom. He has been working as a lecturer of Zoology, University of Dhaka since 2015. Recently, he has conducted research projects on amphibian physiology and disease entitled “Identification of the presence of antimicrobial substances in skin secretions of anurans of Bangladesh” and “Prevalence of chytridiomycosis disease in amphibians of Bangladesh.” Since 2012, Mokhlesur has been involved in various research projects on amphibians, mammals, and other taxa. His main areas of research interest are physiology, adaptation, behavior, disease, ecology, and evolution of wildlife.



M A Razzaque Sarker has recently joined the University of New England, Australia, as a research student. Since 2016, Razzaque worked in the Padma Multipurpose Bridge Project (PMBP) as a field officer and museum assistant. After beginning work as a graduate student at the University of Dhaka, he focused on the herpetofauna of Bangladesh. His fields of interest include herpetofaunal diversity, conservation and management of sea snakes, acoustic analysis of amphibian calls, and genetic analysis of cryptic species.



Ahsan Rahman Jamee graduated with a degree in Statistics from the University of Dhaka in 2016. In 2017, Ahsan received a Master’s degree from the same institution with a thesis entitled “Truncated Poisson-exponential survival regression model: illustration to BDHS-2014 data” under the supervision of Professor Dr. Wasimul Bari. Currently, he is working on survival analysis and bioscience. He is mainly interested in survival analysis, public health, and epidemiology.

Supplementary Table 1. Human perceptions toward frogs and toads in relation to different socio-economic status of the respondents.

A = Aged, M = Middle aged, A₁ = Adolescent; M₁ = Male, F = Female; I = Islam, S = Sonaton, C = Christian; F₁ = Farmer, N = Non-farmer, S₁ = Student; I₁ = Illiterate, L = Low educated, H = Highly educated; L₁ = Low, M₂ = Medium, H₁ = High, R = Rural, U = Urban.

Human Perception (Frogs/Toads)		Age		Sex		Religion			Occupation			Education			Land Holding Status			Social Media Use		Locality		
		A	M	A ₁	M ₁	F	I	S	C	F ₁	N	S ₁	I ₁	L	H	L ₁	M ₂	H ₁	Y	N	R	U
Fearful	Yes (%)	18	10.2	7.7	3.3	20.4	11.8	9.4	13.3	10.3	15	7.8	14.3	8.5	12.3	15.2	8.8	10.5	7.1	13.8	9.6	15.9
	No (%)	82	89.8	92.3	96.7	79.6	88.2	90.6	86.7	89.7	85	92.2	85.7	91.5	87.7	84.8	91.2	89.5	92.9	86.2	90.4	84.1
	χ^2	2.886	—	—	17.001	—	0.333	—	—	2.549	—	—	1.460	—	—	2.171	—	—	2.378	—	1.950	—
Poisonous	df	2	—	—	1	—	2	—	—	2	—	—	2	—	—	2	—	—	1	—	1	—
	p	0.236	—	—	0.000	—	0.847	—	—	0.280	—	—	0.482	—	—	0.338	—	—	0.123	—	0.163	—
	Yes (%)	12	16.3	15.4	17.9	12.4	14.4	13.2	23.3	25.6	16.8	8.9	13	16	16.9	16.3	16	5.3	7.1	19.7	17.4	10.1
Sharing human habitat is harmful	No (%)	88	83.7	84.6	82.1	87.6	85.6	86.8	76.7	74.4	83.2	91.1	87	84	83.1	83.7	84	94.7	92.9	80.3	82.6	89.9
	χ^2	0.541	—	—	1.377	—	1.777	—	—	6.279	—	—	0.482	—	—	1.599	—	—	6.638	—	1.969	—
	df	2	—	—	1	—	2	—	—	2	—	—	2	—	—	2	—	—	1	—	1	—
Believe preconception	p	0.763	—	—	0.241	—	0.411	—	—	0.043	—	—	0.786	—	—	0.449	—	—	0.01	—	0.161	—
	Yes (%)	10	10.9	12.8	13.8	8	9.8	7.5	23.3	12.8	14	6.7	14.3	11.7	6.2	15.2	8	10.5	8.3	12.5	12	8.7
	No (%)	90	89.1	87.2	86.2	92	90.2	92.5	76.7	87.2	86	93.3	85.7	88.3	93.8	84.8	92	89.5	91.7	87.5	88	91.3
Seen attacking people	χ^2	0.185	—	—	2.061	—	5.523	—	—	2.850	—	—	2.452	—	—	2.821	—	—	0.958	—	0.536	—
	df	2	—	—	1	—	2	—	—	2	—	—	2	—	—	2	—	—	1	—	1	—
	p	0.912	—	—	0.151	—	0.063	—	—	0.240	—	—	0.293	—	—	0.244	—	—	0.328	—	0.464	—
Killing is a credit	Yes (%)	20	12.9	17.9	21.1	8.8	11.8	17	30	23.1	15.9	11.1	14.3	19.1	10.8	20.7	12	10.5	11.9	17.1	18.6	7.2
	No (%)	80	87.1	82.1	78.9	91.2	88.2	83	70	76.9	84.1	88.9	85.7	80.9	89.2	79.3	88	89.5	88.1	82.9	81.4	92.8
	χ^2	1.707	—	—	6.880	—	6.609	—	—	3.074	—	—	2.170	—	—	3.426	—	—	1.132	—	4.837	—
Human perceptions toward herpetofauna in northwestern Bangladesh	df	2	—	—	1	—	2	—	—	2	—	—	2	—	—	2	—	—	1	—	1	—
	p	0.426	—	—	0.009	—	0.037	—	—	0.215	—	—	0.338	—	—	0.180	—	—	0.287	—	0.028	—
	Yes (%)	14	8.2	7.7	13	5.3	9.8	13.2	0	25.6	3.7	8.9	6.5	11.7	9.2	8.7	10.4	5.3	11.9	7.9	12	2.9
Human perceptions toward herpetofauna in northwestern Bangladesh	No (%)	86	91.8	92.3	87	94.7	90.2	86.8	100	74.4	96.3	91.1	93.5	88.3	90.8	91.3	89.6	94.7	88.1	92.1	88	97.1
	χ^2	1.650	—	—	4.129	—	4.073	—	—	16.253	—	—	1.359	—	—	0.585	—	—	1.029	—	4.760	—
	df	2	—	—	1	—	2	—	—	2	—	—	2	—	—	2	—	—	1	—	1	—
Human perceptions toward herpetofauna in northwestern Bangladesh	p	0.438	—	—	0.042	—	0.131	—	—	0.000	—	—	0.507	—	—	0.746	—	—	0.310	—	0.029	—
	Yes (%)	8	3.4	5.1	6.5	2.7	3.9	5.7	6.7	2.6	6.5	3.3	6.5	5.3	1.5	8.7	1.6	5.3	3.6	5.3	4.2	5.8
	No (%)	92	96.6	94.9	93.5	97.3	96.1	94.3	93.3	97.4	93.5	96.7	93.5	94.7	98.5	91.3	98.4	94.7	96.4	94.7	95.8	94.2
Human perceptions toward herpetofauna in northwestern Bangladesh	χ^2	1.798	—	—	1.964	—	0.579	—	—	1.595	—	—	2.100	—	—	6.021	—	—	0.348	—	0.283	—
	df	2	—	—	1	—	2	—	—	2	—	—	2	—	—	2	—	—	1	—	1	—
	p	0.407	—	—	0.161	—	0.749	—	—	0.450	—	—	0.350	—	—	0.049	—	—	0.555	—	0.595	—

Supplementary Table 2. Human perceptions toward snakes in relation to different socio-economic status of the respondents. A = Aged, M = Middle aged, A₁ = Adolescent; M₁ = Male, F = Female; I = Islam, S = Sonaton, C = Christian; F₁ = Farmer, N = Non-farmer, S₁ = Student; I₁ = Illiterate, L = Low educated, H = Highly educated; L₁ = Low, M₂ = Medium, H₁ = High, R = Rural, U = Urban.

Human Perception (Snakes)		Age		Sex		Religion			Occupation			Education			Land Holding Status			Social Media Use		Locality		
		A	M	A ₁	M ₁	F	I	S	C	F ₁	N	S ₁	I ₁	L	H	L ₁	M ₁	H ₁	Y	N	R	U
Fearful	Yes(%)	88	89.1	84.6	84.6	92	88.2	96.2	73.3	84.6	87.9	90	85.7	88.3	90.8	84.8	89.6	94.7	90.5	86.8	89.2	85.5
	No(%)	12	10.9	15.4	15.4	8	11.8	3.8	26.7	15.4	12.1	10	14.3	11.7	9.2	15.2	10.4	5.3	9.5	13.2	10.8	14.5
	χ^2	0.598	—	—	3.153	—	9.605	—	—	0.770	—	—	0.865	—	—	2.037	—	—	0.683	—	0.644	—
	<i>p</i>	0.742	—	—	0.076	—	0.008	—	—	0.681	—	—	0.649	—	—	0.361	—	—	0.408	—	0.422	—
	Yes(%)	94	98	97.4	95.9	98.2	95.4	100	100	94.9	97.2	97.8	94.8	97.9	98.5	98.9	95.2	100	98.8	96.1	97.6	95.7
Poisonous	No(%)	6	2	2.6	4.1	1.8	4.6	0	0	5.1	2.8	2.2	5.2	2.1	1.5	1.1	4.8	0	1.2	3.9	2.4	4.3
	χ^2	2.058	—	—	1.078	—	3.913	—	—	0.816	—	—	2.019	—	—	3.170	—	—	1.429	—	0.647	—
	<i>df</i>	2	—	—	1	—	2	—	—	2	—	—	2	—	—	2	—	—	1	—	1	—
	<i>p</i>	0.357	—	—	0.299	—	0.141	—	—	0.665	—	—	0.364	—	—	0.205	—	—	0.232	—	0.421	—
	Yes(%)	78	83.7	76.9	76.4	86.7	82.4	81.1	76.7	74.4	85	80	81.8	79.8	83.1	80.4	80.8	89.5	82.1	80.9	82.6	78.3
Sharing human habitat is harmful	No(%)	22	16.3	23.1	23.6	13.3	17.6	18.9	23.3	25.6	15	20	18.2	20.2	16.9	19.6	19.2	10.5	17.9	19.1	17.4	21.7
	χ^2	1.397	—	—	4.122	—	0.537	—	—	2.329	—	—	0.290	—	—	0.902	—	—	0.053	—	0.616	—
	<i>df</i>	2	—	—	1	—	2	—	—	2	—	—	2	—	—	2	—	—	1	—	1	—
	<i>p</i>	0.497	—	—	0.042	—	0.765	—	—	0.312	—	—	0.865	—	—	.637	—	—	0.818	—	0.433	—
	Yes(%)	46	43.5	48.7	48	41.6	40.5	49.1	60	38.5	55.1	35.6	53.2	42.6	38.5	54.3	39.2	36.8	33.3	51.3	47.9	37.7
Believe preconception	No(%)	54	56.5	51.3	52	58.4	59.5	50.9	40	61.5	44.9	64.4	46.8	57.4	61.5	45.7	60.8	63.2	66.7	48.7	52.1	62.3
	χ^2	0.365	—	—	0.967	—	4.320	—	—	8.365	—	—	3.466	—	—	5.459	—	—	7.071	—	2.062	—
	<i>df</i>	2	—	—	1	—	2	—	—	2	—	—	2	—	—	2	—	—	1	—	1	—
	<i>p</i>	0.833	—	—	0.325	—	0.115	—	—	0.015	—	—	0.177	—	—	0.065	—	—	0.008	—	0.151	—
	Yes(%)	76	78.9	66.7	74	78.8	77.8	73.6	73.3	76.9	79.4	72.2	74	72.3	84.6	72.8	76.8	89.5	77.4	75.7	82	62.3
Seen attacking people	No(%)	24	21.1	23.3	26	21.2	22.2	26.4	26.7	23.1	20.6	27.8	26	27.7	15.4	27.2	23.2	10.5	22.6	24.3	18	37.7
	χ^2	2.556	—	—	0.743	—	0.546	—	—	1.418	—	—	3.518	—	—	2.453	—	—	0.089	—	10.488	—
	<i>df</i>	2	—	—	1	—	2	—	—	2	—	—	2	—	—	2	—	—	1	—	1	—
	<i>p</i>	0.279	—	—	0.389	—	0.761	—	—	0.492	—	—	0.172	—	—	0.293	—	—	0.766	—	0.001	—
	Yes(%)	54	43.5	38.5	48.8	40.7	48.4	34	46.7	41	55.1	34.4	48.1	40.4	47.7	46.7	42.4	52.6	39.3	48	45.5	43.5
Killing is a credit	No(%)	46	56.5	61.5	51.2	59.3	51.6	66	53.3	59	44.9	65.6	51.9	59.6	52.3	53.3	57.6	47.4	60.7	52	54.5	56.5
	χ^2	2.437	—	—	1.551	—	3.343	—	—	8.748	—	—	1.275	—	—	0.901	—	—	1.671	—	0.081	—
	<i>df</i>	2	—	—	1	—	2	—	—	2	—	—	2	—	—	2	—	—	1	—	1	—
	<i>p</i>	0.296	—	—	0.213	—	0.188	—	—	0.013	—	—	0.529	—	—	0.637	—	—	0.196	—	0.775	—

Supplementary Table 3. Human perceptions toward lizards in relation to different socio-economic status of the respondents. A = Aged, M = Middle aged, A₁ = Adolescent; M₁ = Male, F = Female; I = Islam, S = Sonaton, C = Christian; F₁ = Farmer, N = Non-farmer, S₁ = Student; I₁ = Illiterate, L = Low educated, H = Highly educated; L₁ = Low, M₂ = Medium, H₁ = High, R = Rural, U = Urban

Human Perception (Lizards)		Age		Sex		Religion		Occupation			Education		Land Holding Status			Social Media Use			Locality			
		A	M	A ₁	M ₁	F	I	S	C	F ₁	N	S ₁	I ₁	L	H	L ₁	M ₂	H ₁	Y	N	R	U
Fearful	Yes (%)	24	21.1	12.8	14.6	26.5	17	28.3	23.3	15.4	23.4	18.9	24.7	21.3	13.8	22.8	20	10.5	16.7	22.4	19.2	23.2
	No (%)	76	78.9	87.2	85.4	73.5	83	71.7	76.7	84.6	76.6	81.1	75.3	78.7	86.2	77.2	80	89.5	83.3	77.6	80.8	76.8
	χ^2	1.825	—	—	5.160	—	3.297	—	—	1.312	—	—	2.636	—	—	1.489	—	—	1.086	—	0.489	—
	<i>df</i>	2	—	—	1	—	2	—	—	2	—	—	2	—	—	2	—	—	1	—	1	—
Poisonous	<i>p</i>	0.401	—	—	0.023	—	0.192	—	—	0.519	—	—	0.268	—	—	0.475	—	—	0.297	—	0.485	—
	Yes (%)	44	36.1	23.1	33.3	38.1	33.3	41.5	36.7	28.2	44.9	27.8	37.7	38.3	29.2	38	32	47.4	26.2	40.8	38.3	29
	No (%)	56	63.9	76.9	66.7	61.9	66.7	58.5	63.3	71.8	55.1	72.2	62.3	61.7	70.8	62	68	52.6	73.8	59.2	61.7	71
	χ^2	4.220	—	—	0.572	—	1.165	—	—	7.335	—	—	1.592	—	—	2.094	—	—	5.030	—	1.857	—
Sharing human habitat is harmful	<i>df</i>	2	—	—	1	—	2	—	—	2	—	—	2	—	—	2	—	—	1	—	1	—
	<i>p</i>	0.121	—	—	0.449	—	0.558	—	—	0.026	—	—	0.451	—	—	0.351	—	—	0.025	—	0.173	—
	Yes (%)	8	19.7	10.3	13	18.6	15.7	18.9	10	12.8	15.9	16.7	18.2	13.8	15.4	10.9	18.4	21.1	16.7	15.1	15	17.4
	No (%)	92	80.3	89.7	87	81.4	84.3	81.1	90	87.2	84.1	86.3	81.8	86.2	84.6	89.1	81.6	78.9	83.3	84.9	85	82.6
Believe preconception	χ^2	4.921	—	—	1.385	—	1.140	—	—	0.311	—	—	0.612	—	—	2.725	—	—	0.096	—	0.217	—
	<i>df</i>	2	—	—	1	—	2	—	—	2	—	—	2	—	—	2	—	—	1	—	1	—
	<i>p</i>	0.085	—	—	0.239	—	0.566	—	—	0.856	—	—	0.736	—	—	0.256	—	—	0.756	—	0.642	—
	Yes (%)	30	14.3	20.5	21.1	15.9	17.6	17	26.7	17.9	25.2	11.1	26	20.2	7.7	26.2	14.4	10.5	10.7	23	18	20.3
Seen attacking people	No (%)	70	85.7	79.5	78.9	84.1	82.4	83	73.3	82.1	74.8	88.9	74	79.8	92.3	73.8	85.6	89.5	89.3	77	82	79.7
	χ^2	6.182	—	—	1.054	—	1.470	—	—	6.443	—	—	8.020	—	—	5.670	—	—	5.407	—	0.174	—
	<i>df</i>	2	—	—	1	—	2	—	—	2	—	—	2	—	—	2	—	—	1	—	1	—
	<i>p</i>	0.045	—	—	0.305	—	0.480	—	—	0.040	—	—	0.018	—	—	0.059	—	—	0.020	—	0.676	—
Killing is a credit	Yes (%)	14	12.9	7.7	10.6	14.2	13.7	15.1	0	15.4	7.5	16.7	6.5	11.7	20	13	12.8	5.3	17.9	9.2	12.6	11.6
	No (%)	86	87.1	92.3	89.4	85.8	86.3	84.9	100	84.6	92.5	83.3	93.5	88.3	80	87	87.2	94.7	82.1	90.8	87.4	88.4
	χ^2	0.956	—	—	0.704	—	4.883	—	—	4.246	—	—	6.015	—	—	0.949	—	—	3.753	—	0.044	—
	<i>df</i>	2	—	—	1	—	2	—	—	2	—	—	2	—	—	2	—	—	1	—	1	—
Seen attacking people	<i>p</i>	0.620	—	—	0.401	—	0.087	—	—	0.120	—	—	0.049	—	—	0.622	—	—	0.053	—	0.835	—
	Yes (%)	18	9.5	2.6	13	7.1	10.5	13.2	3.3	5.1	17.8	3.3	7.8	13.8	7.7	12	7.2	21.1	6	12.5	10.2	10.1
	No (%)	82	90.5	97.4	87	92.9	89.5	86.8	96.7	94.9	82.2	96.7	92.2	86.2	92.3	88	92.8	78.9	94	87.5	89.8	89.9
	χ^2	5.892	—	—	2.266	—	2.084	—	—	12.432	—	—	2.292	—	—	3.992	—	—	2.539	—	0.000	—
Seen attacking people	<i>df</i>	2	—	—	1	—	2	—	—	2	—	—	2	—	—	2	—	—	1	—	1	—
	<i>p</i>	0.053	—	—	0.132	—	0.353	—	—	0.002	—	—	0.318	—	—	0.136	—	—	0.111	—	0.994	—

Supplementary Table 4. Human perceptions toward monitor lizards in relation to different socio-economic status of the respondents.

A = Aged, M = Middle aged, A₁ = Adolescent; M₁ = Male, F = Female; I = Islam, S = Sonaton, C = Christian; F₁ = Farmer, N = Non-farmer, S₁ = Student; I₁ = Illiterate, L = Low educated, H = Highly educated; L₁ = Low, M₂ = Medium, H₁ = High, R = Rural, U = Urban.

Human Perception (Monitor Lizards)		Age		Sex		Religion		Occupation			Education		Land Holding Status			Social Media Use		Locality				
		A	M	A ₁	M ₁	F	I	S	C	F ₁	N	S ₁	I1	L	H	L ₁	M ₂	H ₁	Y	N	R	U
Fearful	Yes (%)	74	74.1	61.5	69.1	75.2	74.5	71.7	60	66.7	73.8	72.2	72.7	69.1	75.4	71.7	71.2	78.9	76.2	69.7	71.9	72.5
	No (%)	26	25.9	38.5	30.9	24.8	25.5	28.3	40	33.3	26.2	27.8	27.3	30.9	24.6	28.3	28.8	21.1	23.8	30.3	28.1	27.5
	χ^2	2.555	—	—	1.093	—	2.625	—	—	0.731	—	—	0.769	—	—	0.498	—	—	1.119	—	0.009	—
Poisonous	df	2	—	—	1	—	2	—	—	2	—	—	2	—	—	2	—	—	1	—	1	—
	p	0.279	—	—	0.296	—	0.269	—	—	0.694	—	—	0.681	—	—	0.780	—	—	0.290	—	0.925	—
	Yes (%)	72	71.4	82.1	72.4	74.3	73.2	75.5	70	71.8	72.9	74.4	68.8	77.7	72.3	72.8	76	57.9	76.2	71.7	74.9	69.6
Sharing human habitat is harmful	No (%)	28	28.6	17.9	27.6	25.7	26.8	24.5	30	28.2	27.1	25.6	31.2	22.3	27.7	27.2	24	42.1	23.8	28.3	25.1	30.4
	χ^2	1.833	—	—	0.118	—	0.295	—	—	0.114	—	—	1.731	—	—	2.780	—	—	0.555	—	0.697	—
	df	2	—	—	1	—	2	—	—	2	—	—	2	—	—	2	—	—	1	—	1	—
Believe preconception	p	0.400	—	—	0.731	—	0.863	—	—	0.944	—	—	0.421	—	—	0.249	—	—	0.456	—	0.404	—
	Yes (%)	78	61.9	79.5	68.3	68.1	68.6	73.6	56.7	66.7	72.9	63.3	74	71.3	56.9	65.2	68.8	78.9	64.3	70.4	70.1	63.8
	No (%)	22	38.1	20.5	31.7	31.9	31.4	26.4	43.3	33.3	27.1	36.7	26	28.7	43.1	34.8	31.2	21.1	35.7	29.6	29.9	36.2
Seen attacking people	χ^2	7.194	—	—	0.001	—	2.562	—	—	2.114	—	—	5.429	—	—	1.410	—	—	0.931	—	0.892	—
	df	2	—	—	1	—	2	—	—	2	—	—	2	—	—	2	—	—	1	—	1	—
	p	0.027	—	—	0.980	—	0.278	—	—	0.347	—	—	0.066	—	—	0.494	—	—	0.335	—	0.345	—
Killing is a credit	Yes (%)	52	38.1	43.6	47.2	36.3	42.5	43.4	36.7	35.9	57	26.7	48.1	44.7	30.8	48.9	36.8	42.1	26.2	50.7	43.1	39.1
	No (%)	48	61.9	56.4	52.8	63.7	57.5	56.6	63.3	64.1	43	73.3	51.9	55.3	69.2	51.1	63.2	57.9	73.8	49.3	56.9	60.9
	χ^2	3.014	—	—	2.858	—	0.407	—	—	19.184	—	—	4.802	—	—	3.193	—	—	13.300	—	0.318	—
Seen attacking people	df	2	—	—	1	—	2	—	—	2	—	—	2	—	—	2	—	—	1	—	1	—
	p	0.222	—	—	0.091	—	0.816	—	—	0.000	—	—	0.091	—	—	0.203	—	—	0.000	—	0.573	—
	Yes (%)	44	37.4	38.5	43.9	33.6	44.4	34	20	56.4	28	44.4	33.8	36.2	49.2	34.8	42.4	36.8	48.8	33.6	40.7	34.8
Killing is a credit	No (%)	56	62.6	61.5	56.1	66.4	55.6	66	80	43.6	72	55.6	66.2	63.8	50.8	65.2	57.6	63.2	51.2	66.4	59.3	65.2
	χ^2	0.686	—	—	2.614	—	7.025	—	—	11.498	—	—	4.063	—	—	1.333	—	—	5.294	—	0.723	—
	df	2	—	—	1	—	2	—	—	2	—	—	2	—	—	2	—	—	1	—	1	—
Killing is a credit	p	0.710	—	—	0.106	—	0.030	—	—	0.003	—	—	0.131	—	—	0.514	—	—	0.021	—	0.395	—
	Yes (%)	44	29.9	33.3	38.2	28.3	34.6	30.2	33.3	30.8	43	23.3	37.7	35.1	26.2	37	32.8	21.1	26.2	37.5	32.9	34.8
	No (%)	56	70.1	66.7	61.8	71.7	65.4	69.8	66.7	69.2	57	76.7	62.3	64.9	73.8	63	67.2	78.9	73.8	62.5	67.1	65.2
Killing is a credit	χ^2	3.316	—	—	2.588	—	0.351	—	—	8.636	—	—	2.283	—	—	1.843	—	—	3.107	—	0.075	—
	df	2	—	—	1	—	2	—	—	2	—	—	2	—	—	2	—	—	1	—	1	—
	p	0.191	—	—	0.108	—	0.839	—	—	0.013	—	—	0.319	—	—	0.398	—	—	0.078	—	0.784	—

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